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10/774,399	02/10/2004	Benjamin Arnette Lagrange	839-1433	9855

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NIXON & VANDERHYE P.C.  
901 NORTH GLEBE ROAD, 11TH FLOOR  
ARLINGTON, VA 22203

EXAMINER
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VERDIER, CHRISTOPHER M

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3745

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05/14/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/774,399

Applicant(s)

LAGRANGE ET AL.

Examiner

Christopher Verdier

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 26 February 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 10-40 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 10-40 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

Applicant's Amendment dated February 26, 2007 has been carefully considered but is non-persuasive. At the outset, Applicants and the Attorney of Record are thanked for their wishes for a speedy recovery as well as their offer of an interview.

Claims 10-40 are pending. The claims have been amended to overcome the objection to the specification as failing to provide proper antecedent basis for the claimed subject matter of claims 10, 11, and 29, which now recite that the angle is 25.78 degrees. However, claims 10 and 29, which recite that a point defined by intersecting tangent lines along the pressure faces of the bottommost tang does not lie along either line that forms the angle of 25.78 degrees with the center line, have no antecedent basis in the specification. Claim 11, which recites that a point defined by intersecting tangent lines along the pressure faces of the bottommost fillet does not lie along either line that forms the angle of 25.78 degrees with the centerline, has no antecedent basis in the specification. MPEP 608.01 (o) requires that "The meaning of every term used in any of the claims should be apparent from the descriptive portion of the specification with clear disclosure as to its import; and in mechanical cases, it should be identified in the descriptive portion of the specification by reference to the drawing, designating the part or parts therein to which the term applies." MPEP 608.01(o) also requires that "While an applicant is not limited to the nomenclature used in the application as filed, he or she should make appropriate amendment of the specification whenever this nomenclature is departed from by amendment of the claims so as to have clear support or antecedent basis in the specification for the new terms appearing in the claims. This is necessary in order to insure certainty in construing the claims in the light of the specification, *Ex parte Kotler*, 1901 C.D. 62, 95 O.G. 2684 (Comm'r Pat. 1901). See 37 CFR

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1.75, MPEP § 608.01(i) and § 1302.01. Note that examiners should ensure that the terms and phrases used in claims presented late in prosecution of the application (including claims amended via an examiner's amendment) find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description, see 37 CFR 1.75(d)(1). If the examiner determines that the claims presented late in prosecution do not comply with 37 CFR 1.75(d)(1), applicant will be required to make appropriate amendment to the description to provide clear support or antecedent basis for the terms appearing in the claims provided no new matter is introduced." It is respectfully suggested that Applicant amend the specification to state these features in order to overcome these objections.

Applicant has amended independent claims 10, 11, and 29 to recite that the uppermost tangs or fillets on either side of a center line bisecting each of the buckets respectively define two points of a line that form an angle of 25.78 degrees with the center line, and that each of the points is determined by intersecting tangent lines along pressure faces of the respective uppermost tangs or fillets, with the lines defined by the uppermost tangs or fillets not coinciding with a point formed by the bottommost tang or fillet. Applicant has further argued that none of the cited references teach or suggest these angular relationships. These arguments are respectfully disagreed with. Amended independent claims 10, 11, and 29 still do not specifically recite the particular geometry of the intersection of the angle formed by tangent lines along uppermost tangs or fillets on either side of the center line bisecting each of the buckets to define over the applied references. That is, a line drawn from the intersection of the angle formed by

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tangent lines to pressure faces of the two uppermost tangs or fillets (shown in figure 1 of United Kingdom Patent 677,142 at the intersection near the marked 55 degree angle as an example) on each side of a center line bisecting each of the buckets may be selectively drawn such that it intersects the center line (at a portion of the center line remote from the blade root) and forms the aforementioned 25.78 degree angle, with the lines defined by the uppermost tangs or fillets not coinciding with a point formed by the bottommost tang or fillet, such that this angle is the same as Applicant's angle E of 25.78 degrees in figure 10, since the location where the drawn line that forms the angle E intersects the center line is an arbitrary location. See the annotated figure later below.

As set forth in the previous Office action, Applicant is entitled to an interview in this application and the examiner would be willing to discuss these issues and work with Applicant in order to attempt to derive mutually acceptable claim language that defines over the prior art.

### *Specification*

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required:

Claims 10 and 29, which recite that a point defined by intersecting tangent lines along the pressure faces of the bottommost tang does not lie along either line that forms the angle of 25.78 degrees with the centerline, have no antecedent basis in the specification.

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Claim 11, which recites that a point defined by intersecting tangent lines along the pressure faces of the bottommost fillet does not lie along either line that forms the angle of 25.78 degrees with the centerline, has no antecedent basis in the specification.

It is suggested that Applicant amend the specification to state these features in order to overcome these objections.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 10-40 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 10, lines 12-13 recite that the two uppermost tangs on either side of a center line bisecting each of the buckets define two points of a line that form an angle of 25.78 degrees with the center line. This is inaccurate and should be amended to state that the two uppermost tangs on either side of a center line bisecting each of the buckets each respectively define a point of a line that forms an angle of 25.78 degrees with the center line, since each tang defines the point of the line. Claim 11, lines 12-13 recite that the two uppermost fillets on either side of a center line bisecting each of the buckets define two points of a line that form an angle of 25.78 degrees with the center line. This is inaccurate and should be amended to state that the two uppermost fillets on either side of a center line bisecting each of the buckets each respectively define a point of a line that forms an angle of 25.78 degrees with the center line, since each fillet defines the point of the line. Claim 29, lines 4-5 recite that the two uppermost

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tangs on either side of a center line bisecting each of the buckets define two points of a line that form an angle of 25.78 degrees with the center line. This is inaccurate and should be amended to state that the two uppermost tangs on either side of a center line bisecting each of the buckets each respectively define a point of a line that forms an angle of 25.78 degrees with the center line, since each tang defines the point of the line.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

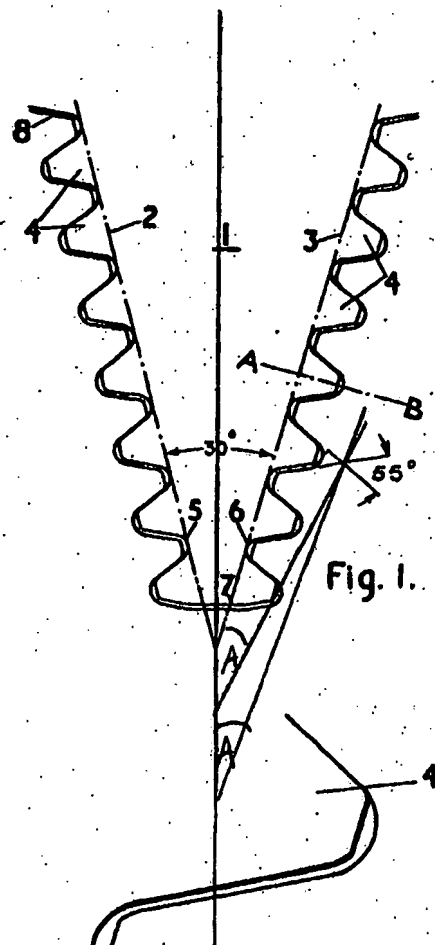
A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 29-30, as far as they are definite and understood, are rejected under 35 U.S.C. 102(b) as being anticipated by United Kingdom Patent 677,142. Note the unnumbered bucket for insertion into an unnumbered wheelpost of an unnumbered turbine rotor in a third stage of a turbine, the bucket being formed from interleaved unnumbered fillets and tangs 4 which complement interleaved fillets and tangs formed in the wheelpost, with the two uppermost tangs on either side of a center line bisecting each of the buckets each respectively defining a point of a line that forms an angle of 25.78 degrees, with each of the points being determined by intersecting tangent lines along pressure faces of the respective uppermost tangs, and a point define by intersecting tangent lines along pressure faces of the bottommost tang does not lie on either line that forms the angle of 25.78 degrees. The bucket has three interleaved tangs and fillets. Note that these claims still do not specifically recite the particular geometry of the

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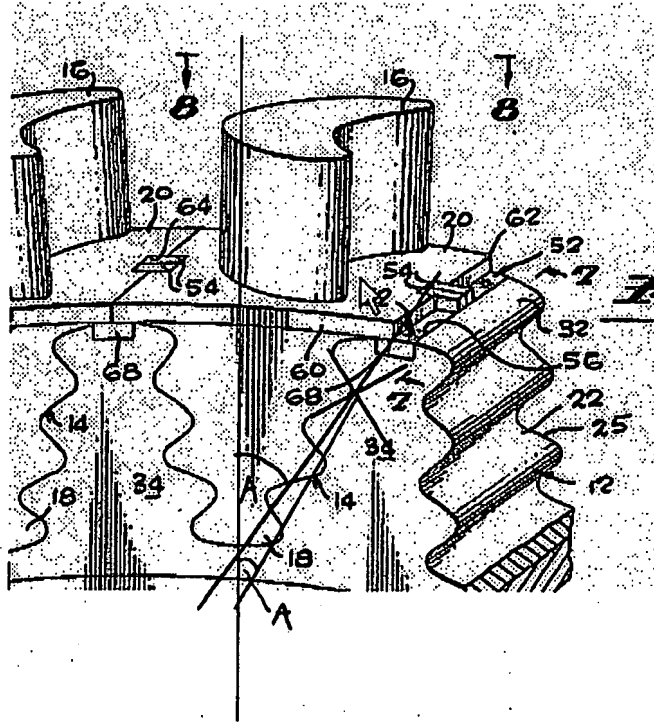
intersection of the angle formed by tangent lines along uppermost tangs on either side of the center line bisecting each of the buckets. That is, a line drawn from the intersection of the angle formed by tangent lines to pressure faces of the two uppermost tangs (shown in figure 1 of United Kingdom Patent 677,142 at the intersection near the marked 55 degree angle as an example) on each side of a center line bisecting each of the buckets may be selectively drawn such that it intersects the center line (at a portion of the center line remote from the blade root) and forms the aforementioned 25.78 degree angle, with the lines defined by the uppermost tangs not coinciding with a point formed by the bottommost tang, such that this angle is the same as Applicant's angle E of 25.78 degrees in figure 10, since the location where the drawn line that forms the angle E intersects the center line is an arbitrary location. See the annotated figure below.





Claims 29-32 and 34-36, as far as they are definite and understood, are rejected under 35 U.S.C. 102(b) as being anticipated by Webb 3,202,398. Webb discloses a bucket 16 for insertion into a wheelpost 34 of a turbine rotor 10 in a third stage of a turbine, the bucket being formed from interleaved unnumbered fillets and tangs which complement interleaved fillets and tangs (near 22) formed in the wheelpost. The bucket has three interleaved tangs and fillets. The bucket has a bottom tang 18 formed from curved surfaces having more than one radius of curvature. The bucket further includes at least one straight surface (the leading and trailing edges). The bucket has an upper tang formed from curved surfaces having more than one radius of curvature. The two uppermost tangs on either side of a center line bisecting each of the buckets each respectively define a point of a line that forms an angle of 25.78 degrees, with each of the points being determined by intersecting tangent lines along pressure faces of the respective uppermost tangs, and a point defined by intersecting tangent lines along pressure faces of the bottommost tang does not lie on either line that forms the angle of 25.78 degrees. Note that these claims still do not specifically recite the particular geometry of the intersection of the angle formed by tangent lines along uppermost tangs on either side of the center line bisecting each of the buckets. That is, a line drawn from the intersection of the angle formed by tangent lines to pressure faces of the two uppermost tangs on each side of a center line bisecting each of the buckets may be selectively drawn such that it intersects the center line (at a portion of the center line remote from the blade root) and forms the aforementioned 25.78 degree angle, with the lines defined by the uppermost tangs not coinciding with a point formed by the bottommost tang, such that this angle is the same as Applicant's angle E of 25.78 degrees in figure 10, since the location

where the drawn line that forms the angle  $E$  intersects the center line is an arbitrary location. See the annotated figure below.



### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

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invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 10-13, 21, and 25, as far as they are definite and understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over United Kingdom Patent 677,142 (figures 1-2) in view of Applicant's Prior Art. The United Kingdom Patent discloses a turbine comprising an unnumbered wheel (the rotor disc) having plural unnumbered broach slots (which complement the firtree shape of the blade roots 1), each having an unnumbered interleaved system of fillets and tangs (which complement the firtree shape of the blade roots 1), plural unnumbered buckets each having a corresponding interleaved system of unnumbered fillets and tangs 4 so that the plural buckets can be fitted, one to one, into the plural broach slots on the wheel, with the interleaved system of fillets and tangs on the buckets and unnumbered wheelposts inherently acting to reduce stresses acting on the fitted buckets and wheelposts (due to the firtree shape), the fillets and tangs of the interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces, with the fillets formed on the plural buckets and the fillets formed on the plural wheelposts having angles of 55 degrees. There may be three interleaved tangs. Each of the wheelposts includes two unnumbered straight surfaces (which complement the firtree shape of the blade roots 1). The two uppermost tangs on either side of a center line bisecting each of the buckets each respectively define a point of a line that forms an angle of 25.78 degrees, with each of the points being determined by intersecting tangent lines along pressure faces of the respective uppermost tangs, and a point define by intersecting tangent lines along pressure faces of the bottommost tang does not lie on either line that forms the angle of 25.78 degrees. The two uppermost fillets on either side of a center line bisecting each of the

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buckets each respectively define a point of a line that forms an angle of 25.78 degrees, with each of the points being determined by intersecting tangent lines along pressure faces of the respective uppermost fillets, and a point defined by intersecting tangent lines along pressure faces of the bottommost fillet does not lie on either line that forms the angle of 25.78 degrees. Note that these claims still do not specifically recite the particular geometry of the intersection of the angle formed by tangent lines along uppermost tangs and fillets on either side of the center line bisecting each of the buckets. That is, a line drawn from the intersection of the angle formed by tangent lines to pressure faces of the two uppermost tangs or fillets (shown in figure 1 of United Kingdom Patent 677,142 at the intersection near the marked 55 degree angle as an example) on each side of a center line bisecting each of the buckets may be selectively drawn such that it intersects the center line (at a portion of the center line remote from the blade root) and forms the aforementioned 25.78 degree angle, with the lines defined by the uppermost tangs or fillets not coinciding with a point formed by the bottommost tang or fillet, such that this angle is the same as Applicant's angle E of 25.78 degrees in figure 10, since the location where the drawn line that forms the angle E intersects the center line is an arbitrary location. See the annotated figure above.

However, the United Kingdom Patent does not disclose that the turbine has multiple stages, with the third stage having the above fillet and tang configurations and ninety wheelposts/broach slots that receive ninety buckets (claims 10 and 11).

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Applicant's Prior Art (paragraph two) states that as many as 92 buckets are present in a turbine, which one of ordinary skill in the art would consider as a reasonable number. Using this guideline, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of United Kingdom Patent 677,142 with a specific number of wheelposts/broach slots that receive a specific number of buckets, such as ninety, for the purpose of adjusting the output of the turbine for differing applications. The recitation of the turbine being directed to the third stage is a matter of choice in design. One of ordinary skill in the art would have recognized that the number of broach slots disclosed by United Kingdom Patent 677,142 would also be applicable to a third stage turbine wheel, for the purpose of providing a gas turbine engine of acceptable efficiency with acceptable loads on a third stage wheel.

Claims 14-19, 22-24, and 26-27, as far as they are definite and understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over United Kingdom Patent 677,142 and Applicant's Prior Art as applied to claims 13, 10, and 21 above, and further in view of Johnson 5,147,180. The modified United Kingdom Patent 677,142 shows all of the claimed subject matter, with the buckets including straight surfaces, and the wheelposts including straight surfaces, but does not show the buckets having a bottom tang formed from curved surfaces having more than one radius of curvature (claims 14 and 22), does not show the wheelposts having a bottom fillet formed from curved surfaces having more than one radius of curvature (claims 16 and 24), does not show the curved surfaces of the bucket bottom tang having radii of

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curvatures of .1992 inches and .3360 inches (claims 18 and 26), and does not show the wheelpost bottom fillet having radii of curvatures of .2052 inches and 0.3420 inches (claims 19 and 27).

Johnson shows a turbine blade 10 having unnumbered buckets, with the buckets having a bottom tang 32 formed from curved surfaces having more than one radius of curvature R11, R12, with wheelposts (see figure 2) having a bottom fillet formed from curved surfaces having more than one radius of curvature that complement the radius of curvature R11, R12, and with an upper tang 28 formed from curved surfaces having more than one radius of curvature R3, R4, for the purpose of minimizing peak blade root and groove stresses.

It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified turbine of United Kingdom Patent 677,142 such that the buckets have the bottom tang formed from curved surfaces having more than one radius of curvature, such that the wheelposts have the bottom fillet formed from curved surfaces having more than one radius of curvature, and such that the upper tang is formed from curved surfaces having more than one radius of curvature, as taught by Johnson, for the purpose of minimizing peak blade root and groove stresses.

The recitation of the curved surfaces of the bucket bottom tang having radii of curvatures of .1992 inches and .3360 inches, and the recitation of the wheelpost bottom fillet having radii of curvatures of .2052 inches and 0.3420 inches are deemed to be matters of choice in design. The radii of curvature of curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet

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are recognized by Johnson to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to select the radii of curvature of the curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet to be specific values, such as .1992 inches and .3360 inches for the bucket bottom tang, and such as .2052 inches and 0.3420 inches for the wheelpost bottom fillet, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 20 and 28, as far as they are definite and understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over United Kingdom Patent 677,142 and Applicant's Prior Art as applied to claims 10 and 11 above, and further in view of Caruso 6,030,178. The modified United Kingdom Patent 677,142 shows a turbine substantially as claimed as set forth above, including unnumbered wheelposts, but does not show that the outer tang edge of each wheelpost is scalloped so as to reduce the weight of the turbine wheel.

Caruso (figure 1) shows a turbine wheel 10 having wheelposts shown generally at 12, which are formed such that an unnumbered outer tang edge of each wheelpost is scalloped, for the inherent purpose of reducing weight of the turbine wheel.

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It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified turbine of United Kingdom Patent 677,142 such that the outer tang edge of each wheelpost is scalloped, as taught by Caruso, for the purpose of reducing weight of the turbine wheel.

Claims 31-40, as far as they are definite and understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over United Kingdom Patent 677,142 in view of Johnson 5,147,180. United Kingdom Patent 677,142 shows all of the claimed subject matter as previously set forth above (with regard to claims 29-30), with the buckets including straight surfaces, and the wheelposts including straight surfaces, but does not show the curved surfaces of the bucket bottom tang having radii of curvatures of .1992 inches and .3360 inches (claim 33), does not show the bucket having a bottom tang formed from curved surfaces having more than one radius of curvature (claim 31), does not show the bucket having an upper tang formed from curved surfaces having more than one radius of curvature (claims 34-35), and does not show the bucket having an intermediate tang formed from curved surfaces having more than one radius of curvature (claims 37-39).

Johnson shows a turbine blade 10 having unnumbered buckets, with the buckets having a bottom tang 32 formed from curved surfaces having more than one radius of curvature R11, R12, with wheelposts (see figure 2) having a bottom fillet formed from curved surfaces having more than one radius of curvature that complement the radius of curvature R11, R12, and with an upper tang 28 formed from curved surfaces having more than one radius of curvature R3, R4,



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and with an intermediate tang 30 formed from curved surfaces having more than one radius of curvature R7, R8, for the purpose of minimizing peak blade root and groove stresses.

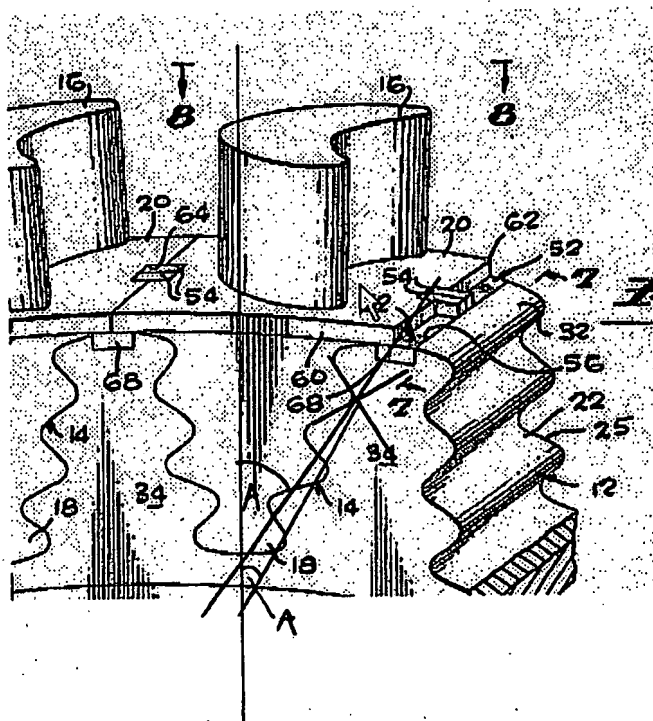
It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of United Kingdom Patent 677,142 such that the buckets have the bottom tang formed from curved surfaces having more than one radius of curvature, such that the wheelposts have the bottom fillet formed from curved surfaces having more than one radius of curvature, such that the upper tang is formed from curved surfaces having more than one radius of curvature, and such that the intermediate tang is formed from curved surfaces having more than one radius of curvature, as taught by Johnson, for the purpose of minimizing peak blade root and groove stresses.

The recitation of the curved surfaces of the bucket bottom tang having radii of curvatures of .1992 inches and .3360 inches is deemed to be matters of choice in design. The radii of curvature of curved surfaces of the bucket bottom tang are recognized by Johnson to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to select the radii of curvature of the curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet to be specific values, such as .1992 inches and .3360 inches for the bucket bottom tang, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 10-11, 13-17 and 21-25, as far as they are definite and understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Webb 3,202,398 in view of Applicant's Prior Art. Webb discloses a turbine substantially as claimed, comprising a wheel 10 having plural broach slots 22, each having an interleaved system of fillets and tangs, and plural buckets 16 each having a corresponding interleaved system of fillets and tangs so that the plural buckets can be filled, one to one, into the plural broach slots, with the interleaved system of fillets and tangs on the buckets and wheelposts 34 inherently acting to reduce stresses acting on the fitted buckets and wheelposts (due to the dovetail shape), the fillets and tangs of the interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces. The buckets and wheelposts have three interleaved tangs and fillets. Each of the buckets has a bottommost tang 18 formed from unnumbered curved surfaces having more than one radius of curvature (at the bottom of the tang and the top of the tang). Each bucket has straight surfaces (the leading and trailing edges). Each of the wheelposts has an unnumbered bottom fillet formed from curved surfaces having more than one radius of curvature (at the bottom and at the top). Each wheelpost includes unnumbered straight surfaces. The two uppermost tangs on either side of a center line bisecting each of the buckets each respectively define a point of a line that forms an angle of 25.78 degrees, with each of the points being determined by intersecting tangent lines along pressure faces of the respective uppermost tangs, and a point defined by intersecting tangent lines along pressure faces of the bottommost tang does not lie on either line that forms the angle of 25.78 degrees. The two uppermost fillets on either side of a center line bisecting each of the buckets each respectively define a point of a line that forms an angle of 25.78 degrees, with each

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of the points being determined by intersecting tangent lines along pressure faces of the respective uppermost fillets, and a point defined by intersecting tangent lines along pressure faces of the bottommost fillet does not lie on either line that forms the angle of 25.78 degrees. Note that these claims still do not specifically recite the particular geometry of the intersection of the angle formed by tangent lines along uppermost tangs and fillets on either side of the center line bisecting each of the buckets. That is, a line drawn from the intersection of the angle formed by tangent lines to pressure faces of the two uppermost tangs or fillets on each side of a center line bisecting each of the buckets may be selectively drawn such that it intersects the center line (at a portion of the center line remote from the blade root) and forms the aforementioned 25.78 degree angle, with the lines defined by the uppermost tangs or fillets not coinciding with a point formed by the bottommost tang or fillet, such that this angle is the same as Applicant's angle E of 25.78 degrees in figure 10, since the location where the drawn line that forms the angle E intersects the center line is an arbitrary location. See the annotated figure below.



However, Webb does not disclose that the turbine has multiple stages, with the third stage having the above fillet and tang configurations and ninety wheelposts/broach slots that receive ninety buckets (claims 10 and 11).

Applicant's Prior Art (paragraph two) states that as many as 92 buckets are present in a turbine, which one of ordinary skill in the art would consider as a reasonable number. Using this guideline, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Webb with a specific number of wheelposts/broach slots that receive a specific number of buckets, such as ninety, for the purpose of adjusting the output of the turbine for differing applications. The recitation of the turbine being directed to the third stage is a matter of choice in design. One of ordinary skill in the art would have recognized that the number of broach slots disclosed by Webb would also be applicable to a third stage turbine wheel, for the purpose of providing a gas turbine engine of acceptable efficiency with acceptable loads on a third stage wheel.

Claims 18-19 and 26-27, as far as they are definite and understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Webb 3,202,398 and Applicant's Prior Art as applied to claims 14, 16, 22, and 24 above. The modified turbine of Webb show all of the claimed subject matter except for the curved surfaces of the bucket bottom tang having radii of curvatures

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of .1992 inches and .3360 inches (claims 18 and 26), and except for the wheelpost bottom fillet having radii of curvatures of .2052 inches and 0.3420 inches (claims 19 and 27).

The recitation of the curved surfaces of the bucket bottom tang having radii of curvatures of .1992 inches and .3360 inches, and the recitation of the wheelpost bottom fillet having radii of curvatures of .2052 inches and 0.3420 inches are deemed to be matters of choice in design. The radii of curvature of curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet are known in the art to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to select the radii of curvature in the modified turbine of Webb such that the radii of curvature of the curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet are specific values, such as .1992 inches and .3360 inches for the bucket bottom tang, and such as .2052 inches and 0.3420 inches for the wheelpost bottom fillet, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 20 and 28, as far as they are definite and understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Webb 3,202,398 and Applicant's Prior Art as applied to claims 10 and 11 above, and further in view of Caruso 6,030,178. The modified turbine of Webb shows a turbine substantially as claimed as set forth above, including unnumbered

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wheelposts, but does not show that the outer tang edge of each wheelpost is scalloped so as to reduce the weight of the turbine wheel.

Caruso (figure 1) shows a turbine wheel 10 having wheelposts shown generally at 12, which are formed such that an unnumbered outer tang edge of each wheelpost is scalloped, for the inherent purpose of reducing weight of the turbine wheel.

It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified turbine of Webb such that the outer tang edge of each wheelpost is scalloped, as taught by Caruso, for the purpose of reducing weight of the turbine wheel.

Claim 33, as far as it is definite and understood, is rejected under 35 U.S.C. 103(a) as being unpatentable over Webb 3,202,398. Webb discloses a bucket 16 for insertion into a wheelpost 34 of a turbine rotor 10 in a third stage of a turbine, substantially as claimed as set forth above, but does not disclose that the curved surfaces of the bucket bottom tang have radii of curvatures of .1992 inches and .3360 inches.

The recitation of the curved surfaces of the bucket bottom tang having radii of curvatures of .1992 inches and .3360 inches is deemed to be a matter of choice in design. The radii of curvature of curved surfaces of the bucket bottom tang is known in the art to be a result-effective variable which, when optimized, reduce the stresses in the blade roots and the grooves. It would

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have been further obvious at the time the invention was made to a person having ordinary skill in the art to select the radii of curvature of the curved surfaces of the bucket bottom tang to be specific values, such as .1992 inches and .3360 inches, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Verdier whose telephone number is (571) 272-4824. The examiner can normally be reached on Monday-Friday from 10:00-6:30.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward K. Look can be reached on (571) 272-4820. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

C.V.  
May 10, 2007

  
Christopher Verdier  
Primary Examiner  
Art Unit 3745